

**AMERICAN
TECHNOLOGY
INITIATIVE**

Aerospace Research, Technology Transfer and Commercialization

*To: Maylene
Duenas**Fr.: David
Lloyd
Amtech*

June 7, 1995

TO: Maylene Duenas
Technical Monitor
NASA Ames Research Center

FROM: David Lloyd *DLloyd*
Principal Investigator

RE: Periodic Research Report, NCC2-648

Enclosed is a Status Report on AmTech's implementation of the JSR Program, for the period ending March 31, 1995. This report is submitted at this time, at your request, in partial fulfillment of NASA/AmTech Cooperative Agreement NCC2-684.

Please contact me or Karen Robbins of the AmTech staff if you have questions concerning this report.

Encl.

cc: Kevin Barquinero
JSR Program Manager
NASA Headquarters

NASA Joint Sponsored Research Program



Status Report

**Use of Space Act Authority to
Develop Joint Sponsored Research Projects
and Industry-led R&D Consortia
(1988-1995)**

**Presented to
NASA Office of Commercial Technology (Code XC)**

**Program implemented by
American Technology Initiative, Inc.**

(Submitted in partial fulfillment of the requirements of NASA/AmTech Cooperative Agreement NCC2-648)



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OUTLINE

- Reporting Requirements
- Background
- Objectives of JSR Project Efforts
- Results
- Conclusions
- Recommendations

REPORTING REQUIREMENTS

Additional JSR Program reports will be presented no later than December 31, 1995 (to summarize results of activity for the period ending 9/30/95) regarding ...

- Design of comprehensive JSR Program (per NASA/AmTech MOA of 6/15/92)
- Role and performance of third party, nonprofit as facilitator of NASA/industry R&D collaboration (per cooperative agreement NCC2-648)
- Implementation of JSR Program at other NASA Centers (as requested by the Office of Aeronautics)
- Implementation of an industry-based rotorcraft technology alliance (as requested by the Office of Aeronautics)
- Feasibility report of JSR-based multimedia technology project at NASA Ames (as requested by ARC Code DK)

Chronology of use of Space Act authority in JSR Program

- 1984-1987: Researched mechanisms for conducting R&D collaborations using funded Space Act Agreement
Project: NASA - Hastings Research Project
- 1987-1989: Prototype project explored and implemented to demonstrate feasibility of mechanism
Project: SFSU - Joint Enterprise Program
- 1989: Senior NASA management briefed on results; delegation of authority requested; new program formed to implement next phase of development
Project: NASA JSR Program Implementation: AmTech formed 10/1/89
- 1990: Conditional authority provided to negotiate 2-3 JSR projects
- 1991: JSR Program results reported; conditional authority expanded to 4 structured projects and 10 prospects approved for conversion to agreements
- 1992 - 1994: Letter delegation of authority signed; JSR Program objective to fully test program potential per delegation of authority and MOA, and report on technology transfer research findings; Program results reported 11/93
- 1994 - 1995(3 mos.): Direct NASA funding of industry-led R&D consortia; JSR PAT process begun for Center-wide implementation of Program; expanded scope to all forms of partnership & technology commercialization research; focus NASA on Ames only

From the JSR Program evolved a limited set of objectives regarding JSR Project activity ...

- Process ... Develop a process that works within NASA and for private sector
- Legal Agreement Instrument ... Develop a model JSR legal agreement that can be customized to prospective NASA/industry partner needs
- Pilot Projects ... Form projects to test process and levels of demand
- Results ... Measure results of efforts to apply process and form projects
- Conclusions ... Draw conclusions about what does and does not work
- Re-engineering ... Refine and streamline process to make more user friendly
- Implementation ... Establish JSR PAT process to implement Program Center-wide

and new objectives evolved to support the Ames Commercial Technology Office evolution ...

- Projects, process, expertise and immediacy of response

OBJECTIVES - PROJECT PROCESS

The process of forming R&D collaborations evolved to include eight steps ... each with distinct value added

- Outreach/Inreach ... Technology transfer and JSR Program briefings
- Intake/Referrals ... Gathering and analysis of information on 14 features to determine potential for R&D collaboration
- Technology Transfer Consulting ... Advice on options to use one of NASA's 16 programs or technology transfer agreements
- Referred to Non-JSR Programs ... Preparation of information and liaison to refer intake to non-JSR programs for technology transfer
- Selected and Prepared for JSR Project ... Preparation of information and processing to negotiate JSR Agreement
- Screened/Suspended ... Negotiations suspended due to disagreement on specific terms or conflict with broader, non-JSR policy issues
- Signed ... Agreement successfully negotiated and signed
- Converted to Non-JSR Collaborations ... Non-JSR collaboration formed from referrals to other programs or partially successful JSR negotiations

This process was modified in early 1995 and replaced with an ARC-based CO-ACT coordination process

AmTech monitored the following "measures" of effectiveness in this order of priority ...

<u>Metric</u>	<u>Description</u>
• Number of Projects Processed	Total number of projects at each step in the project process
• Financial Leverage	Ratio of resources contributed by federal/private sector services
• Range of NASA and Industry Served	Breadth of involvement by participants
• Commercial Applications	Type and range of commercial uses of technologies developed
• Patents/Licenses/Copyrights	Number and uses of inventions
• Improvement in NASA Mission R&D	Benefits to NASA mission managers
• Enhance U.S. Competitiveness	Benefits to U.S. industry
• Other Technology Transfer Programs Supported	Range of the programs supported
• ARC Commercial Technology Office focus	Process & task response on project referrals

OBJECTIVES - PROJECT LEGAL INSTRUMENT

The JSR legal agreement for negotiating partnerships with industry was based on legal research, findings and conclusions ...

- Based on range of funded Space Act Agreement authority
- Adjusted to reflect statutory intent and requirements of all technology transfer legislation
- Incorporated relevant portions of applicable commercial code
- Included review of case law and case results from examples in the private sector and other federal agencies
- Modified as needed, within legal/policy parameters, to meet needs of all project participants

RESULTS - NUMBER OF PROJECTS

The Program has generated 178 inquiries for JSR projects, producing 17 R&D collaborations

<u>Steps</u>	<u>1988 - 90</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994/95</u>
• Outreach/Inreach Presentations	N/A	24	37	21	N/A
• Intake	64	35	28	37	14
• Technology Transfer Analyzed	64	32	28	32	14
• Referrals	2	12	16	19	1
• Selected as JSR	14	14	11	13	9
• Screened/ Suspended	9	12	8	9	6
• Signed	2	0	1	1	2
• Converted	3	2	2	3	1
					= 17
• ARC CTO Process Actions	—	—	—	—	19

The Program has generated \$41.7 Million in cash and in-kind resources for the federal government

1988 - 1995 (\$K)

Federal Non-federal

\$45,742.7	\$1,136.5
\$5,873.5	\$39,253.1
1,395.0	1,139.0
75.0	220.0
\$50,086.2	\$41,748.6

Signed JSRs

- cash
- in-kind (\$ equivalent)

Conversions: implemented through other transfer mechanisms

- cash
- in-kind (\$ equivalent)

TOTALS

RESULTS - RANGE OF SERVICE

The Program has found demand for its features across most of NASA Centers and selected industrial segments

	FEDERAL GOVERNMENT										STATE GOV'TS						INDUSTRY BY SIC CODE					
	NASA / OTHER																					
	ARC	LARC	LARC	JSC	JPL	GSFC	DFRC	DOD	FAA		Agriculture	Mining	Construction	Manufacturing	Transp & Utils	Wholesale	Retail	Finance	Services			
Intake	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Signed Projects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
JSR 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
JSR 4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
JSR 6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
JSR 7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
JSR 8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
JSR 9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Conversions	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
JSR 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
JSR 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
JSR 5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
B910	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9102	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9202	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9206	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9302	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9303	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9319	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9324	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

RESULT - SUMMARY ACROSS METRICS

Range of performance by project across remaining metrics

Signed Projects	Commercial Applications	Patent Licenses Copyrights	Improvements in NASA Mission R&D	Enhancement to U.S. Competitiveness	Other Tech Trans Programs Supported
JSR 1	✓	✓	✓	✓	
JSR 4	✓	✓	✓	✓	
JSR 6	✓	✓	✓	✓	
JSR 7	✓		✓		
JSR 8		✓	✓	✓	
JSR 9	✓	✓		✓	✓
Conversions					
JSR 2	✓	✓		✓	
JSR 3	✓		✓		✓
JSR 5	✓	✓	✓	✓	
8910	✓	✓	✓		✓
9102	✓		✓	✓	
9202	✓		✓	✓	
9206	✓	✓	✓		
9302	✓	✓	✓	✓	
9303	✓		✓	✓	✓
9319	✓		✓	✓	✓
9324	✓		✓	✓	✓

RESULTS - INTELLECTUAL PROPERTY

<u>Project</u>	<u>Technology</u>	<u>Patents/Licenses/Copyrights</u>
JSR #1	Mass Spectrometer	5 patents and copyrights; 3 exclusive licenses issued to commercial participant
JSR #4	Aircraft Design Software	4 of 5 releases (4.0) completed; 8 commercial licenses issued
JSR#5	Aircraft Surface Temperature Measurement	1 patent disclosure; non-exclusive licenses issued to commercial participant
JSR #6	Aircraft Surface Air Pressure Measurement	1 patent; 2 additional discoveries eligible for patent or copyright; non-exclusive license issued to commercial participant
JSR #7	Rehydration Fluids	4 formulations in testing and eligible for protection as patent
JSR #8	ERAST Alliance	Proprietary technology shared among industry participants
JSR #9	AGATE Alliance	Jointly developed technology shared among industry participants
10 Other Projects	Various	Wide range of hardware and software projects with potential for 6 new inventions eligible for protection

RESULTS - COMMERCIAL USE

<u>Project</u>	<u>Technology</u>	<u>Commercial Applications</u>
JSR #1	Mass Spectrometer	Improved existing mass spectrometer product - advanced AI improved interpretation; miniaturized features expanded range of markets; adopted after 18 months of development
JSR #2	Calcium Sensor	Spin-off company - project team formed spin-off company funded by Tecknekron
JSR #4	Aircraft Design Software	Software for aircraft adopted - development of first national standard for aircraft design software; adopted completely by Boeing after 24 months of development
JSR #6	Aircraft Surface Air Pressure Measurement	Breakthrough technology - development and successful test of new method of air pressure measurement ... eliminates pressure taps ... provides comprehensive pressure maps ... applied to Boeing 777 design program
JSR #7	Rehydration Fluids	Commercially marketed fitness drinks
JSR #8	ERAST Alliance	Resolve technical problems in development of extreme altitude, long endurance unpowered aircraft
JSR #9	AGATE Alliance	Commercialization of general aviation technology (cockpit displays, computer systems, propulsion sensors, controls, integrated design manufacturing)
9202	Helicopter Safety	Flight planning tool - development of emergency medical helicopter flight planning tool ... immediate test by major commercial user
7 Other Projects	Various	Product and process improvement in 8 product/service categories

RESULTS - ENHANCED R&D

<u>Project</u>	<u>Technology</u>	<u>Improvement in NASA Mission R&D</u>
JSR #1	Mass Spectrometer	<u>Shortened</u> project from 5 to 2 years and provided <u>spin-in</u> of critical software to NASA
JSR #4	Aircraft Design Software	Mechanism permitted <u>pooling</u> of <u>previously proprietary</u> software code creating potential national standard
JSR #7	Rehydration Fluids	<u>Shortened to one year testing</u> rehydration drink for astronauts; astronaut corps has adopted one version of drink; <u>commercial participant paid all costs of testing</u> and is <u>supplying all drinks to NASA astronauts gratis</u> in return for ground based tests
JSR #8	ERAST Alliance	Stimulate UAV airframe industry; enhance upper atmospheric research capability
JSR #9	AGATE Alliance	Stimulate General Aviation industry technologies
9206	Water Purification	<u>Spin-in to NASA</u> of proprietary software for modification specifically to NASA needs for life support system analysis
9202	Helicopter Safety	<u>Corporation providing</u> free testing and staff/engineering to enhance modification of flight risk control mechanism
5 Projects	Various	<u>Advances in rate of R&D</u> ; scope of work; or speed of testing due to partnership

RESULTS - ENHANCED COMPETITIVENESS

<u>Project</u>	<u>Technology</u>	<u>Enhanced Commercial Competitiveness</u>
JSR #4	Aircraft Design Software	Applied as process to Boeing 777 and McDonnell Douglas aircraft; prepared as product for spin-off company in 1996
JSR #5	Aircraft Surface Temperature Measurement	Applied within 1 year to Boeing 777 design test
JSR #6	Aircraft Surface Air Pressure Measurement	Applied to Boeing product line for aircraft design; Boeing qualitative estimate of \$ 10+ million savings in aircraft development process; cancelled Japanese access and exclusive license to open up for potential U.S. consortium
JSR #8	ERAST Alliance	Increase UAV capabilities, enhance U.S. competitive position
JSR #9	AGATE Alliance	Revitalize U.S. general aviation industry; increased OEM production, job creation, and air infrastructure usage
9302	TRACON Software	Long term development plan intends to export software to international market
9303	Remote Phylloxera Sensing	Pilot project for development of turnkey industry and cost savings for wine companies
9319	Telemedicine	Intended to lower distribution cost of specialized medicine to rural areas

RESULTS - SUPPORT OTHER TECHNOLOGY TRANSFER

- **NASA**

Technology Transfer Programs

- RTTC Pilot Project - Codevelop Joint Sponsored Demonstration Agreement
- RTI/AEP Pilot Project - Develop method to jointly pursue R&D collaborations
- JSR PAT - Staff NASA Ames JSR PAT activities

Special Projects

- Incubator Research ... Support to NASA HQ and contractor (IC² Institute) on reviewing incubator options at NASA
- Video Technology Transfer ... Support to NASA Headquarters and contractor for project
- Regional Economic Development ... Participant in two regional development projects: Silicon Valley and Rocky Mountain - Wyoming
- Special NASA Project Teams ... Research support for national benefit and technology transfer teams

Research Programs

- Space Technology Transfer Workshop - Design and conduct, comprehensive technology transfer workshop for ITP (1992)
- Space Station - Design and test implementation of method for transferring large portions of advanced R&D
- ARC Life Support - Audit of all technology transfer over a 3-year period

- **Other Federal**

TRP - 3 proposals initiated and submitted

ARPA/HPCCP - Starting 2nd year of 3-year project to form "technology pull" consortia for commercial HPCC technology

BMDQ - Review/assess technology application panels

DOT/FAA - Link to aeronautics certification commercialization process

Conclusions reached from JSR Project activity ...

- Generates Multiple Benefits ... multi - party collaborations generate financial, R&D and competitiveness benefits
- Requires Multi-step Process ... the benefits are created by executing a variety of value added steps leading to Joint Sponsored Research Agreements
- Requires Facilitated Process ... the generation of the benefits requires an active structuring and negotiating process led by value adding facilitators
- Needs Development of Interdisciplinary Team ... the active structuring and negotiating process requires single team of R&D, legal, financial and process experts
- Reflects Higher Volume Potential ... the volume of results adheres to the level of authorization provided during the pilot test period ... the full potential will require a higher level and formalization of the program authorities
- Reveals Needs of Industry ... strongest need is for special purpose 501(c)(3) in collaborations; also demand for bilateral (NASA - one company) structure; limited demand for trilateral arrangement (NASA - company - academia) with academia as core R&D producer
- Proves concept of Industry-led R&D consortia ... 2 large scale, industry-led consortia implemented to enhance U.S. industries and examine facets of public/private R&D consortia management

RECOMMENDATIONS

Secure permanent use of the JSR Program and disseminate throughout NASA

- Extend Current Authorities
 - delegation of Space Act authority
- Formalize Center-Based JSR Program
 - finalize Program Information Package
- Update Program Implementation Agreement
 - review/modify NASA/AmTech implementation agreements
- Establish NASA-wide Implementation
- Establish JSR Program Metrics
 - develop/adopt performance metrics